

(No Model.)

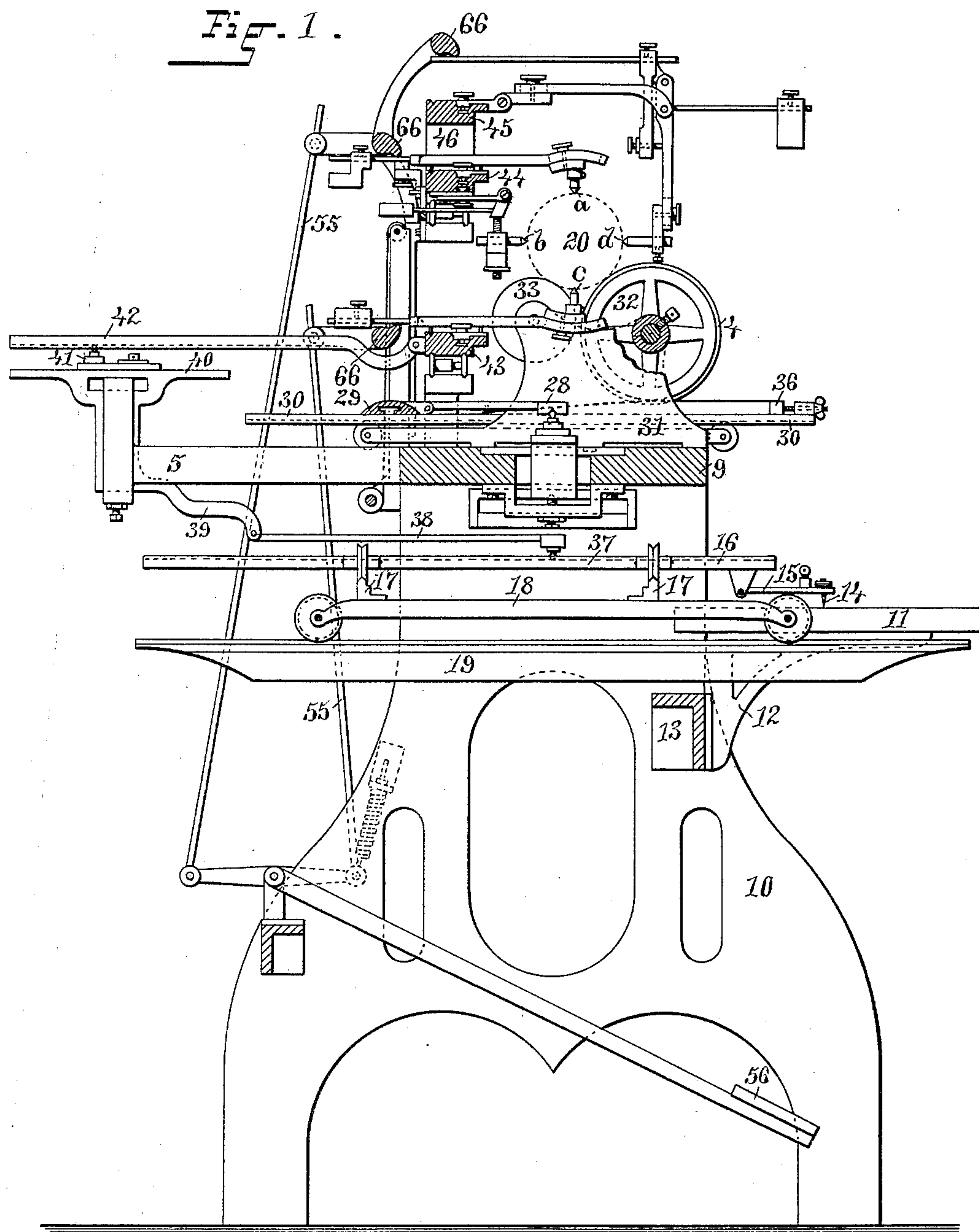
3 Sheets—Sheet 1.

J. HOPE.

PANTOGRAPH ENGRAVING MACHINE.

No. 462,874.

Patented Nov. 10, 1891.



WITNESSES:

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(No Model.)

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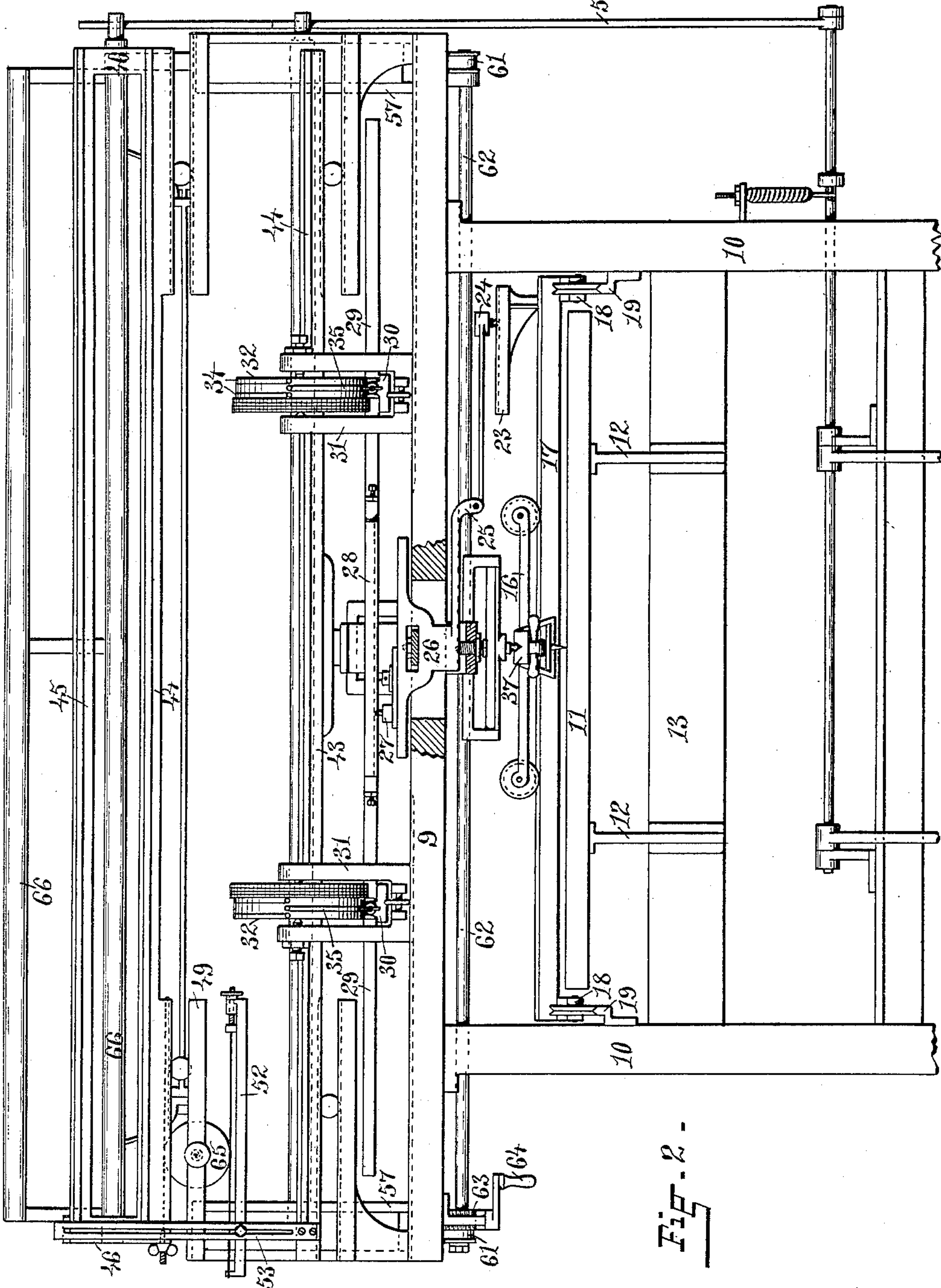


Fig. 2 -

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Fig. 3.

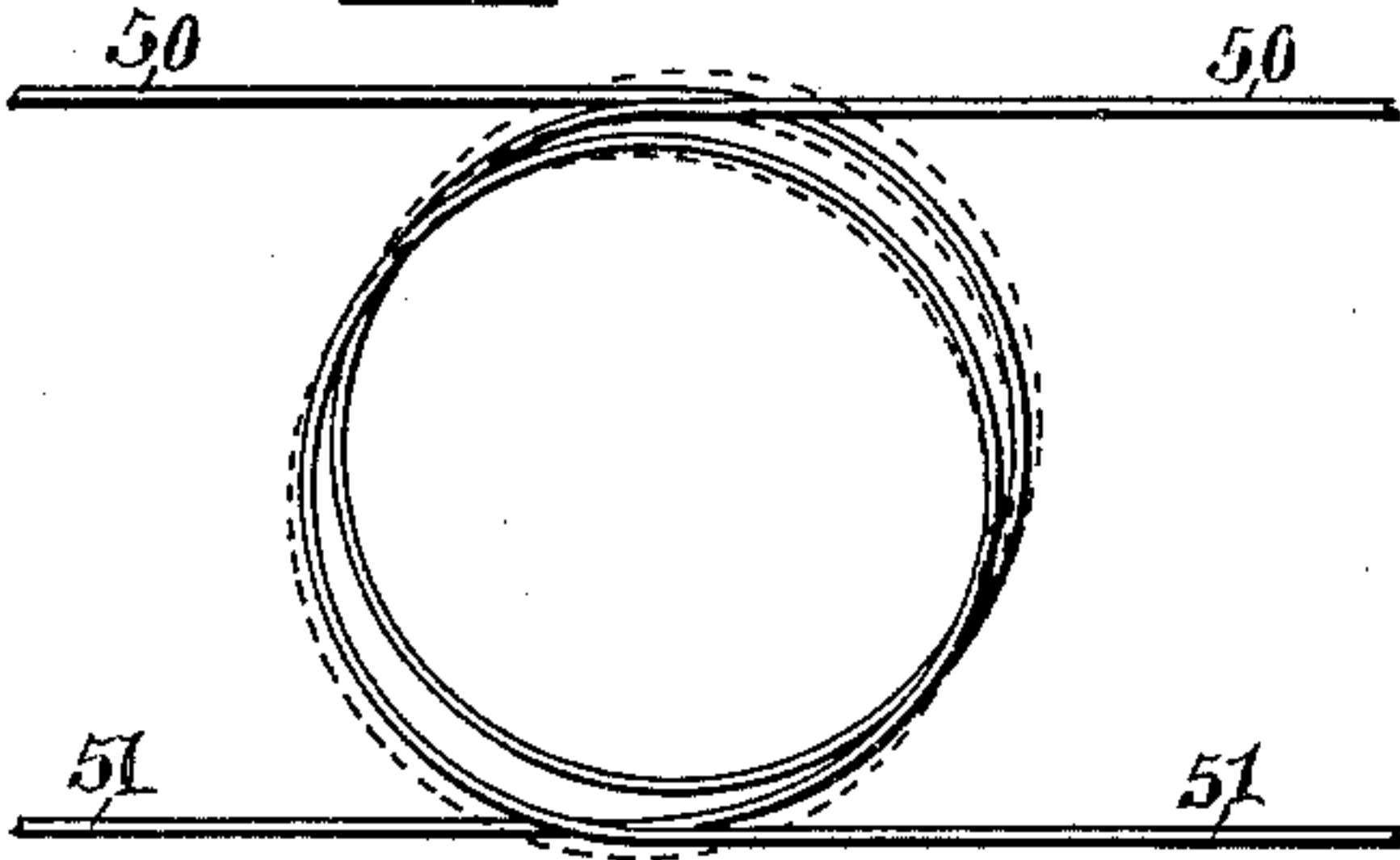


Fig. 4.

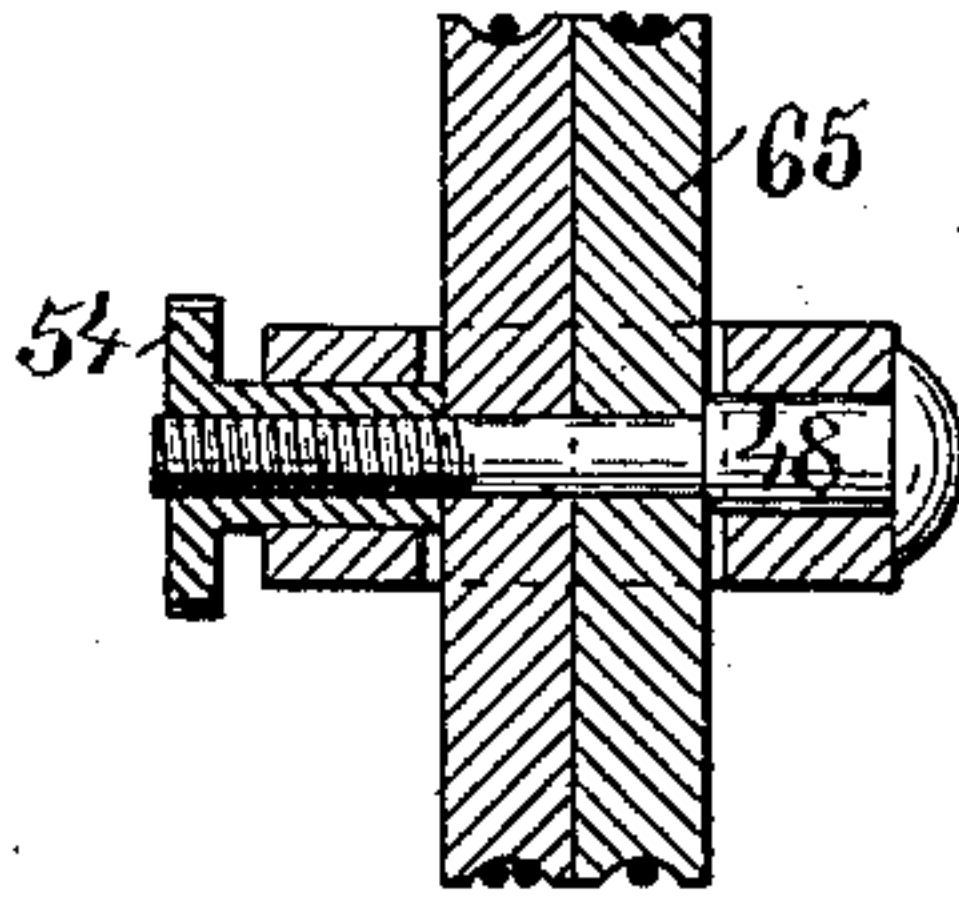


Fig. 5.

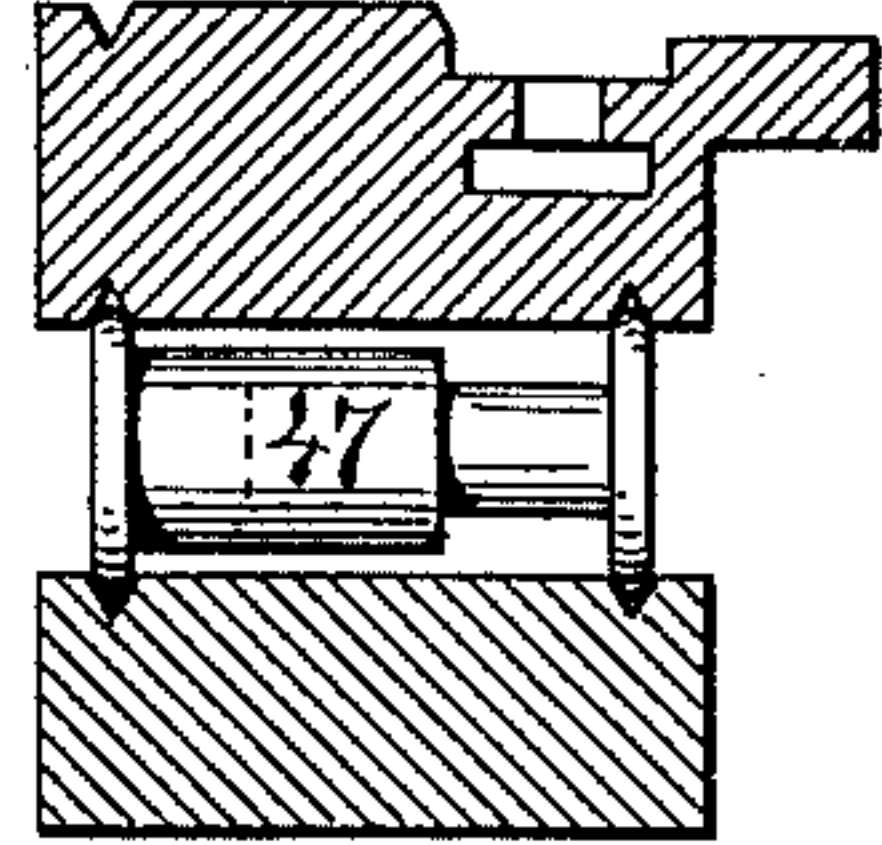


Fig. 6.

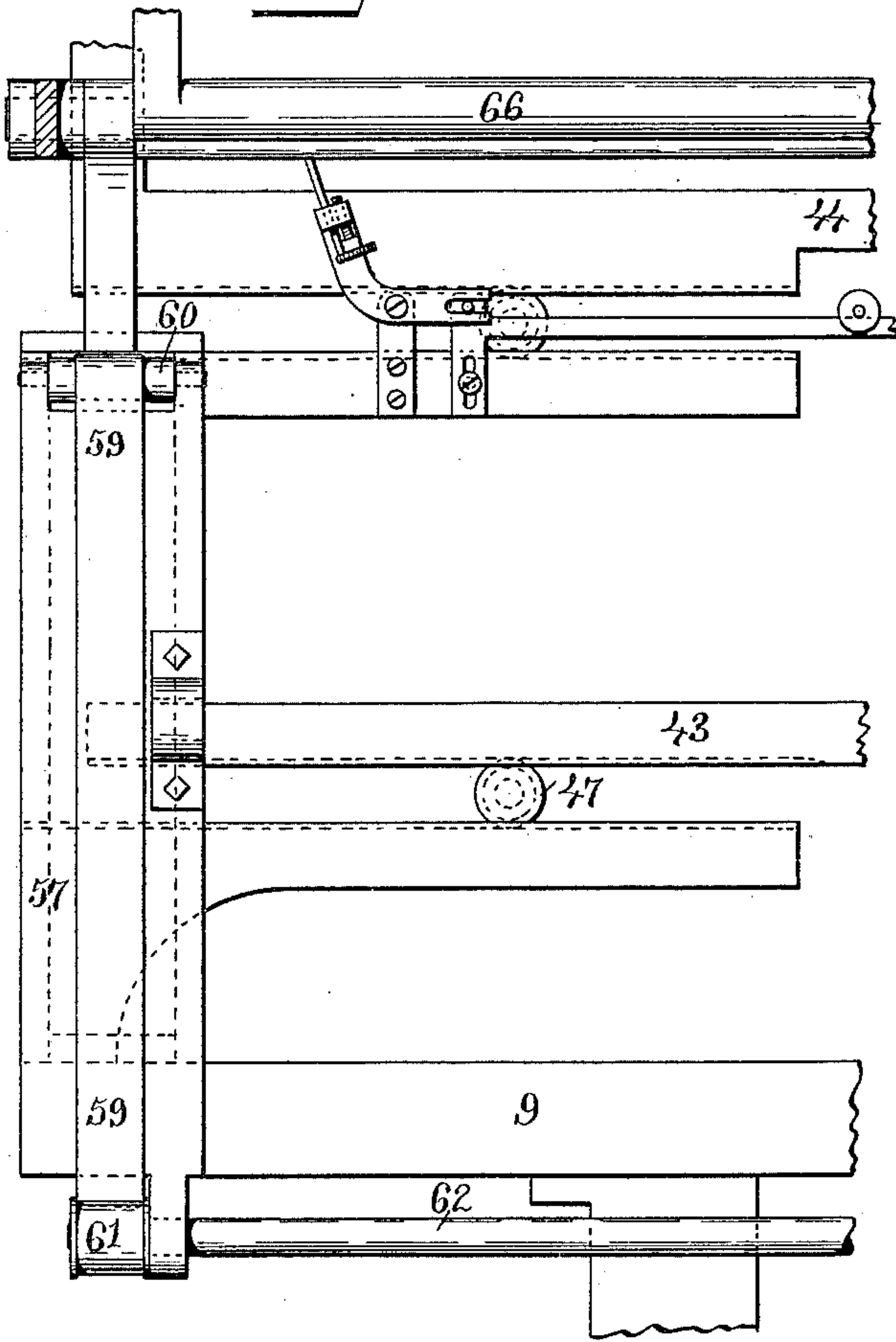


Fig. 7.

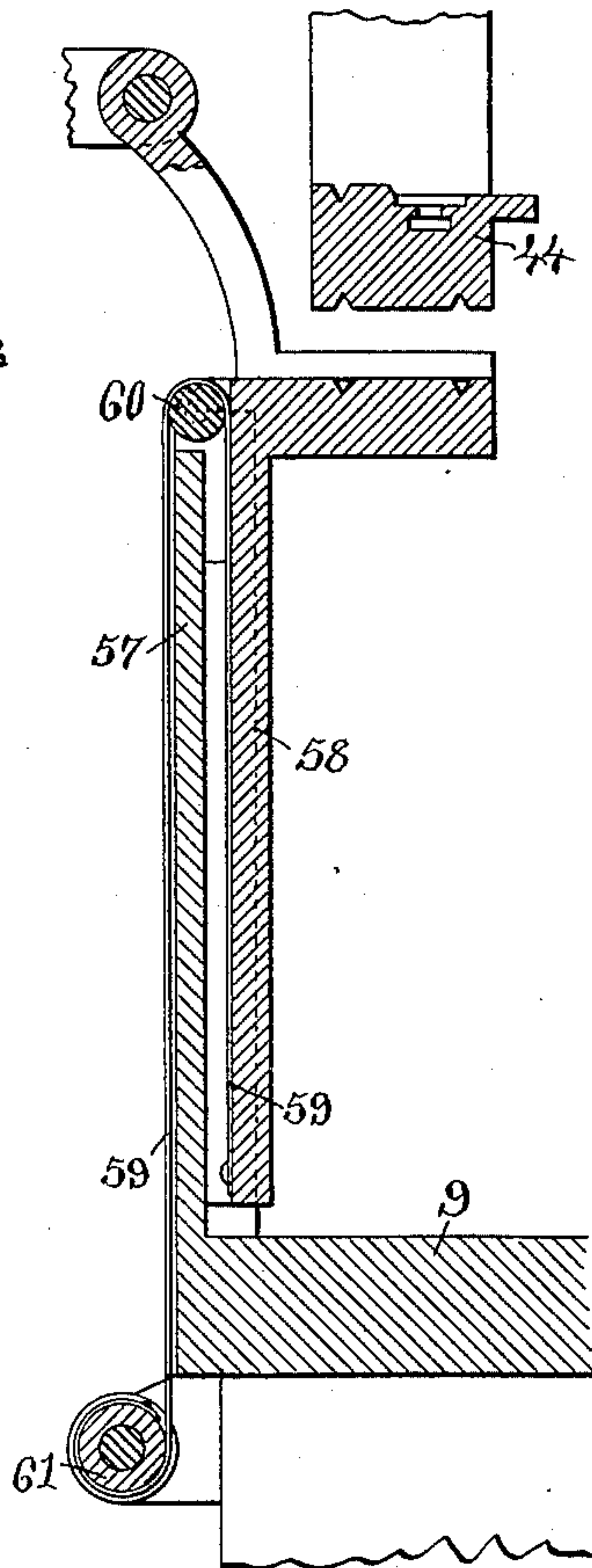
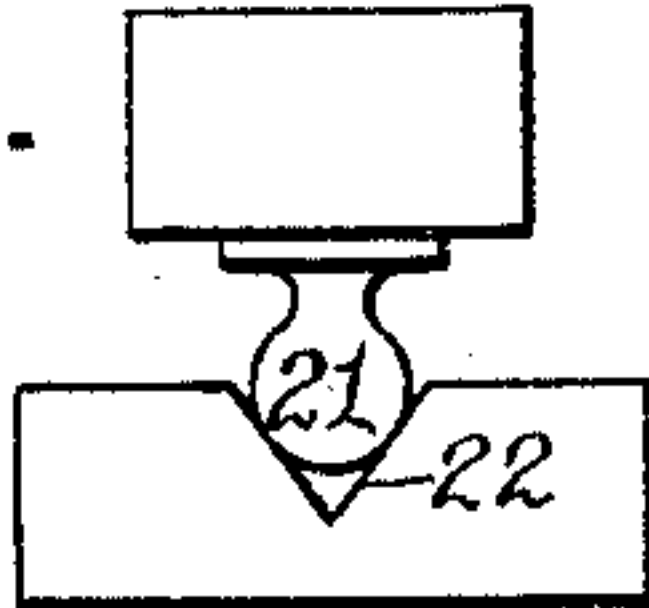


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN HOPE, OF PROVIDENCE, RHODE ISLAND.

PANTOGRAPH ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 462,874, dated November 10, 1891.

Application filed July 31, 1891. Serial No. 401,288. (No model.)

To all whom it may concern:

Be it known that I, JOHN HOPE, of the city of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Pantograph Engraving-Machines; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to improvements in the construction of the class of pantograph engraving-machines used for tracing the drawing on a metal roll by a series of diamond points controlled by a stylus which is made to traverse a pattern of larger size than the drawing traced on the roll. Machines of this class consist of a number of diamond-pointed gravers fixed upon a bar and so connected with a foot-treadle that the operator can bring all the diamond-pointed gravers in contact with the metal roll, so as to trace the pattern on the roll by cutting through the wax or varnish, which resists the action of acids and with which the roll is covered. The bar to which the diamond-pointed gravers are secured has a traverse parallel with the axis of the roll to be engraved and is connected with the stylus-carriage. The roll is supported on milled disks, to which a rotary motion is imparted by the carriage carrying the stylus, so that in tracing any figure or line not parallel with the axis of the roll a compound motion is produced, consisting in the traverse of the bar carrying the diamond-pointed gravers and the rotary motion of the roll. The pattern-sketch, which is usually made of a size larger than the size of the intended figure on the roll, is placed upon the flat surface of a table in front of the operator. Over the sketch is a stylus mounted on a hinged arm secured to a carriage. Every movement of the stylus in tracing the pattern-sketch is transmitted to the bar carrying the gravers and to the roll, so that as many duplicates of the pattern are traced on the roll on a reduced scale as there are gravers. When one line of patterns has been so traced, the roll is turned and another line traced until the whole roll is covered. In this class of pantograph engraving-machines the transmitting mechanism must move with

microscopic accuracy and yet with such ease that all the motions of the roll and the carriages can be produced by the moving of the stylus over the pattern by a girl without causing laborious exertions.

One object of this invention is to reduce the frictional resistance of the moving parts and at the same time increase the accuracy.

Another object of this invention is to produce a pantograph engraving-machine in which two or more carriages each carrying a row of diamond-pointed gravers may be used, so that a number of lines of patterns may be engraved on the roll simultaneously; and another object of this invention is to produce a machine in which a row or rows of patterns may be engraved on a roll and simultaneously therewith a row or rows of patterns may be engraved in the reversed direction, so that complicated continuous patterns in which some of the figures, leaves, or patterns are placed in reversed positions may be engraved from one pattern-sketch.

The invention consists in the peculiar and novel construction and arrangement of a pantograph engraving-machine, as will be more fully set forth hereinafter, and pointed out in the claims.

Figure 1 is a vertical cross-section of my improved pantograph engraving-machine. Fig. 2 is a front view of the same. Fig. 3 is a skeleton view of the wires surrounding the disks shown in Fig. 4. Fig. 4 is a sectional view through the center of the disks. Fig. 5 is a sectional view of the reciprocating carriage and the ways on which it is supported. Fig. 6 is an enlarged view showing the device for vertically adjusting the carriages. Fig. 7 is a sectional view of the same. Fig. 8 is a view of the pivotal bulb, showing the rail with the V-shaped groove in section.

Similar numbers and letters of reference indicate corresponding parts throughout.

In the drawings, the number 10 indicates the end standards on which the machine is supported.

11 indicates the table on which the pattern-sketch is placed. This table is firmly supported on the brackets 12, which are secured to the rail 13. The stylus 14 is placed on the outer end of the tracer-arm 15, which is hinged to the carriage 16, supported by wheels on

the ways 17, which extend lengthwise of the machine and are secured near their ends to the carriages 18, one near each end of the machine, the wheels of which roll on the ways 19, secured to the end standards 10. The carriage 16 follows the motion of the stylus when moved longitudinally to the machine by rolling on the ways 17 and transversely to the machine by moving with the ways 17 and carriages 18 on the ways 19. Thus any part of the carriage 16 moves in unison with the stylus.

The number 20 indicates the roll the outer surface of which is to be engraved. It is shown in broken lines in Fig. 1. It is not shown in Fig. 2.

For the purpose of clearness in the description all reference to longitudinal motion is to be understood as referring to motion parallel to the axis of the roll 20, and all reference to transverse motion a motion in a direction at right angles to the axis, all curves or angular lines being produced by the compound longitudinal and transverse motions.

The transverse motion of the stylus is transformed into a partial rotary motion of the roll. This part of the mechanism of my improved machine differs but slightly from pantograph engraving-machines as heretofore constructed, the essential difference being the improved pivotal bulb connection and consequent modification of the rail which takes the place of the pivotal carriage heretofore used. This pivotal connection is clearly shown in Fig. 8. It consists of the spherical bulb 21, connected by a contracted neck with the arm or lever to which it is secured. The bulb is accurately formed into about two-thirds of a perfect sphere, which rests in the V-shaped groove 22. There are only two small points of contact of the bulb or ball on the sides of the groove. The bulb slides in the groove nearly without friction and secures the great and essential advantage of absolute accuracy, avoiding all the looseness of parts and lost motion incident to the most perfectly constructed and adjusted pivotal carriage as heretofore used in place of the bulb.

The mechanism for transmitting the transverse motion of the stylus consists in the bracketed way 23, secured to the carriage 18, preferably on the right-hand side of the machine, as shown in Fig. 2. The way 23 is provided with the V-shaped groove 22, the direction of the groove being exactly parallel with the axis of the cylinder to be engraved. The arm 24 is provided at its outer end with the bulb 21, which rests in the V-shaped groove of the way 23. The arm 24 is hinged at its opposite end to the lever 25, extending from the pivoted post 26, the upper arm of which is provided with a groove, in which the post 27, provided at its upper end with a spherical bulb, is secured, so as to be readily adjustable with reference to the pivotal center of the post 26. The bulb on the upper end of the post 27 supports the bar 28, provided

with a longitudinal V-shaped groove. The bar 28 is hinged to the rear frame 29, and to the same are connected the ways 30, extending transversely to the machine and supported on wheels journaled in brackets projecting from the slide-stocks 31. These slide-stocks are substantial metal frames, in which the bearing-disk 33 and wheel 32 are journaled. The slide-stocks are firmly secured to the bed-plate 9. They are adjustable laterally to the length of the roll to be engraved. The roll 20 rests on the disks 33 and wheels 32 at each end. The disks 33 are idle-disks freely turning on their journals. The wheels 32 have a milled raised edge on the inner side, as shown in Fig. 2, and a faced surface, to which the ends of the springs 34 and 35 are secured. The other ends of the springs 34 are secured to the blocks 36 on the front ends of the ways 30. The blocks 36 move in T-shaped grooves and are provided with tension-screws, by which the springs can be adjusted. The ends of the springs 35 are secured to blocks on the rear part of the ways 30. These blocks are also provided with tension-screws. By means of these springs the transverse motion of the ways 30 is transmitted to and changed to the rotary motion of the wheels 32 and by the same to the rotary motion of the roll 20.

The longitudinal motion of the stylus is transmitted to the carriages or graver bars in exactly the same manner. The carriage 16 is provided with a rail 37, extending transversely to the machine. This rail is provided with a V-shaped groove, in which the bulb on the end of the hinged arm 38 slides. The arm 38 is hinged to the arm 39, which moves with the pivoted post at the rear of the machine. The upper part of the post has the slide 40, in which the bulb-post 41 is secured, so that it may be adjusted at any required distance from the pivotal center. The arm 42 is hinged to the carriage or graver-bar 43, and thus connects the graver-bar 43 with the bulb on the post 41. Any lateral motion of the carriage 16 is thus transmitted to the graver-bar 43. The arm 42 is made sufficiently rigid to prevent lost motion, the hinged end having considerable width.

The graver-bar 44 is shown in Fig. 1 with two sets of gravers supported by and secured to one bar, while the graver-bars 43 and 45 each are shown as supporting one set of gravers. For ordinary work, in which all the gravers move together, the arrangement shown is the most convenient. The graver-bars 44 and 45 are formed into a frame by the end connections 46 and reciprocate together. All the graver-bars are supported on the double rollers 47, formed of a roller provided with a tubular shaft and a roller provided with a solid shaft which fits closely by a close-sliding fit into the tubular shaft, so that the disks forming the rolls proper can adjust themselves to the grooves in which they roll, as is shown in Fig. 5.

The disks 65 (shown enlarged in Fig. 4) are

mounted on the shaft 48, supported in the ways 49. The rims of the disks are provided with a shallow groove in which the wires 50 and 51 lie. The ends of the wire 50 are secured to the graver-bar 44 and the ends of the wire 51 to the bar 52, connected by the frame 53 with the graver-bar 43. Both wires are provided with tension-screws, by which they are drawn tightly onto the rims of the disks 65. The thumb-screw 54 is used to clamp the disks together, so that the motion of the graver-bar 43 is transmitted to the graver-bar 44, so that when the graver-bar 43 moves to the right the graver-bar 44 will be moving to the left or in the reverse position, and when four graver-bars are used two will move in the direction opposite to the direction of the other two bars, or, more definitely to define the result, two sets of gravers will engrave the reduced pattern on the roll in one position and the other two sets of gravers will engrave the reduced pattern in the reverse position.

The diamond-pointed gravers are indicated by the letters *a*, *b*, *c*, and *d*. They are mounted in hinged arms overbalanced, so that in the normal condition they are held off from but very close to the roll. All the arms of the gravers are operated simultaneously by the rock-bars 66, connected by means of levers and the rods 55 with the foot-treadle 56, through which the operative by a slight pressure of the foot brings all the gravers into contact with the roll to be engraved.

As the diameters of the rolls to be engraved vary considerably, the graver-bars 44 and 45 are made vertically adjustable. To perform this adjustment with the accuracy required in pantograph engraving-machines, the device shown in Figs. 6 and 7 is used, consisting in the end frames 57, firmly secured to and extending upward from the bed-plate 9. These end frames are provided with accurately-planed ways, in which the sliding frame 58 may be reciprocated. The graver-bars 44 and 45 are secured to and supported by the frame 58. To the lower part on each end of the sliding frame 58 a flat sheet-metal strip 59 is secured. This strip passes upward over the roller 60, supported and journaled in the end frames 57, and then passes down and around the drum 61, to which the other end of the strip 59 is secured. The drum 61 is secured to the shaft 62 near each end of the machine. The worm-gear 63 is also secured to the shaft 62. A worm turned by the crank 64 engages with the worm-gear to turn the shaft, so as to wind the metal strip 59 on the drum 61 to raise the vertically-sliding frame 58, and with the same the graver-bars, or lower the frame and bars by unwinding the sheet-metal strip. By this arrangement a very accurate adjustment of the upper graver-bars and the gravers is secured.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a pantograph engraving-machine, the combination, with the stylus, its carriage, and the levers for transmitting the motion of the stylus to the roll to be engraved and to the gravers, of two sets of graver-bars connected through an intermediate disk constructed to move the graver-bars simultaneously in opposite directions, as described.

2. In a pantograph engraving-machine, the combination, with the stylus, its carriage, the levers for transmitting the motion of the stylus, and the gravers, of two graver-bars, one of which has capacity of vertical adjustment, and mechanism connecting the two graver-bars constructed to trace the pattern followed by the stylus on the roll simultaneously in the same and the reverse direction, as described.

3. The combination, in a pantograph engraving-machine, with the stylus, its carriage, and the levers for transmitting the motion of the stylus to the roll to be engraved and to the gravers, of two sets of graver-bars, the upper graver-bars having capacity of vertical adjustment, constructed to support four lines of gravers and engrave four lines of patterns on the rolls simultaneously by the movement of the stylus over the enlarged pattern, as described.

4. The combination, with the levers transmitting the motion of the stylus to the gravers and to the roll to be engraved in a pantograph engraving-machine, of the bulb 21 and the V-shaped groove 22.

5. The combination, with the ways and the graver-bars of a pantograph engraving-machine, of the roller 47, consisting in a disk provided with a tubular shaft and a disk having a shaft supported in the tubular shaft of the other disk, as described.

6. The combination, with the bed-plate 9 and end frames 57, of the sliding frames 58, the metal strip 59, the rollers 60, the drums 61, the shafts 62, and mechanism for rotating the shaft, constructed to adjust the graver-bar of a pantograph engraving-machine, as described.

7. The combination, with the graver-bar 43 and the graver-bar 44, of the wires 50 and 51, the disks 65, and the connections between the wires and the graver-bars, as described.

8. In a pantograph engraving-machine, the combination, with the stylus, its carriage, and the levers transmitting the motion to the longitudinally-reciprocating gravers, of the roll 20, the disks 33, the wheels 32, the springs 34 and 35, the frame 29, the ways 30, and the levers connecting the frame 29 with the stylus-carriage, constructed to transmit the motion of the stylus to the gravers and the roll, as described.

9. The combination, in a pantograph engraving-machine, with the bed-plate 9, of the slide-stocks 31, provided with journals for the bearing disk and wheel, the disks 33, and the wheels 32, having raised milled edges to form the bearing for the roll to be engraved and

connected with the transversely - moving frame, as described.

10. A pantograph engraving-machine consisting of a stylus and mechanism, substantially as described, for transmitting the longitudinal motions of the stylus to two sets of graver - bars, one set of graver-bars having capacity for lateral adjustment, levers for transmitting the transverse motion of the stylus to transversely-moving ways, disks for supporting the roll to be engraved, and flexi-

ble connections between the disks and the transversely-moving frame, the whole constructed to engrave the pattern traversed by the stylus on the roll on a reduced scale by moving two or more lines of gravers longitudinally and rotating the roll, as described.

JOHN HOPE.

Witnesses:

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JOSEPH A. MILLER.